Improv ments relating to cathode plate edge protectors

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Abstract

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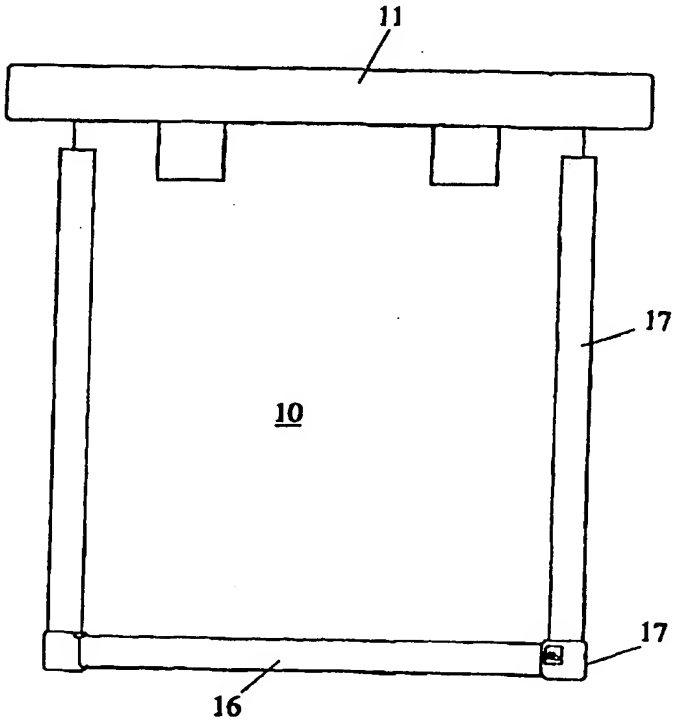
(54) Title: IMPROVEMENTS RELATING TO CATHODE PLATE EDGE PROTECTORS

(57) Abstract

The use of cathode plates for electrolytic copper deposition, coupled with mouldings fitted for edge protection is well established. These include such things as edge strips, gripping edge protectors and dipping in wax, to prevent build-up of the plated metal along the edge portion. These edge protectors are quite effective along the sides, but attempts to fit protectors to the bottom edge of the plates have resulted in the build-up of copper in the gaps at the corner of the plate or the growth of copper nodules beneath the protecting strip, occasioned by thermal expansion and resultant small gaps at the joins. Wax, moreover, dissolves in hot electrolyte solution, causing a build-up of sludge in the refining tanks with substantial reduction in the life and efficiency of the electrolyte. These problems have been overcome by prefiting the cathode plate (10) with bottom (16) and side (11) edge plastic strips, in which the bottom (16) and side (11) edge plastic strips, together with the corner pieces (17), are integrally moulded together, the bottom edge corners of the plate being surrounded in the mould, prior to the injection of the plastic. Alternatively, the bottom and side edge strips (20) and the corner pieces (21) may be prefabricated, so that the corner pieces (21) lock into the plate by means of apertures and are either joined to the bottom and side edge portions (20) by plastic moulding of the corner piece (21) to the joint between the aforesaid bottom and side edge portions (20) or upper (22) and lower (23) wedge clips may be used to snap fit the corner moulding (21) and the bottom and side edge portions (20) together in sealing relationship.



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IMPROVEMENTS RELATING TO CATHODE PLATE EDGE PROTECTORS

The present invention relates to edge strip protection for cathode plates and particularly to such protection of the corners of the cathode plate.

The use of cathode plates for electrolytic metal deposition particularly but not exclusively copper, and other non-ferrous materials is well known.

To simplify removal of deposited metal from the cathode plate after the process, it is desirable to protect the side and bottom of the cathode plate with mouldings fitted to the edge portions; or by the application of wax to the edge portions to prevent build up of copper on the edge portions.

This facilitates the removal of the deposited metal.

Many disclosures occur in the patent literature in the field, for example AU Patent No. 646450 disclosing an edge strip with an expansion channel allowing for thermal expansion.

AU Patent No. 527416 disclosing a similar form of gripping edge protector as being two examples of the prior art.

Alternative means of edge protection include dipping the edge of the cathode plate in a wax bath to prevent build up of metal along the edge portion.

This is used particularly for the bottom edge of the cathode plate and is depicted by way of example in Figure 1 of the drawings herewith.

In the process of refining copper and other non-ferrous metals, stainless steel cathode plates are suspended into an electrolyte solution adjacent to copper anodes.

Through an electrolysis process, pure copper is deposited onto the cathode plates from which it is subsequently removed through a mechanical stripping process.

The use of wax on the edge of the cathode plates, is not an ideal barrier to unwanted copper growth for a number of reasons. Namely that it is easily removed during handling through scratching and bumping of the cathodes, thus permitting the growth of copper in locations where it must be manually removed, and furthermore, some wax dissolves in the hot electrolyte solution causing a build up sludge in the refining tanks and a reduction in the life and efficiency of the electrolyte.

Whilst the side edge protectors previously referred to operate effectively on the side edges of the plate, attempts to fit protectors to the bottom edge portion of the plate have met difficulties in the build up of copper in gaps at the corner of the plate as is best shown in Figure 2 of the drawings.

The thermal expansion of the edge protector creates small gaps at the joins and these gaps permit the growth of copper nodules beneath the edge protecting strip which defeats the prime purpose of the protecting strip and causes premature failure by mechanical failure through stretching of the legs of the strips.

It is an objective of the present invention to overcome at least some of the disadvantages of the prior art in providing a method and apparatus for protecting the edge portions of a cathode plate assembly destined to be immersed in electrolytic solution.

There is provided according to and aspect of the present invention a method of protecting the edge portions of a cathode plate assembly useful for electrolytic deposition techniques, wherein the cathode plate is pre-fitted with bottom edge and side edge plastic strips, the plate and assembled edge strips being fitted into a plastic moulding apparatus such that the bottom edge portion corners of the plate are surrounded in the mould apparatus and comprising the step of injecting plastic into the mould cavity to form moulded corner pieces integrally connected to the edge strips.

Conveniently, the plate is apertured or otherwise configured to form a locking engagement with the moulded corner pieces after flowing of the plastic during the corner moulding process.

There is provided according to a further aspect the present invention a corner moulding for a cathode plate adapted to interengage with side and bottom edge strips in which the moulding is preformed and adapted to be retained by clip means interconnecting the corner moulding and edge strips in sealing relationship with the cathode plate.

Conveniently the clip means comprises releasable clips adapted to interconnect said corner moulding and side moulding preferably in releasable relationship.

Sealant may be injected into the assembled corner moulding to improve sealing between the moulding and the plate.

The plastic corner pieces are therefore mechanically locked and fixed to the plate, and restrain the edges of the edge strip from expanding during the high temperature deposition process.

In an alternative aspect of the invention, there is provided a method of protecting the edge and bottom portions of a cathode plate useful in electrolytic deposition techniques wherein edge portion strips destined to be fitted to the side and bottom edge portions of a cathode plate are joined in an assembled U configuration, plastic moulding of corner pieces to the joint between the bottom edge strip and at least one of the side edge strips prior to fitting of the edge strips to a cathode plate.

The invention will be described in greater detail having reference to the attached drawings in which Figures 1 and 2 represent prior art attempt at edge protection and Figures 3, 4 and 5 depict detailed sketches of the corner moulding technique of the present invention.

Figure 1 is a perspective view of an assembled corner mould without cathode plate.

Figure 7 is an exploded view of the components including the connecting clips.

With reference to the Figures, the cathode plate 10 made of stainless steel is conventionally hung from a horizontal hanging rail 11 which grips the top edge of the cathode plate wherein the cathode plate is adapted to be immersed in an electrolytic bath (not shown) which in copper or like non-ferrous metal.

To facilitate removal of the deposited metal from the cathode plate, after this process, it is desirable that the edges of the cathode plate are kept free of any deposited metal, so that after removal of the cathode plate from the bulk, the deposited metal can be easily removed from the surface of the plate.

Figure 1 shows a prior art method using side plastic edge strips 14 and a waxed bottom edge 15.

In some other arrangements, the side and bottom edges have wax applied thereto to prevent build up of deposited metal.

With reference to Figure 2, this is a prior art attempt at forming mitred corners, together with bottom and side edge plastic strips fitted to the edge portions of the cathode plate.

Unfortunately, it has been found that the mitred corners tend to spread slightly due to differential thermal expansion between the cathode plate and the plastic edge protectors which allows ingress of electrolytic fluid onto the plate depositing copper underneath the edge protectors, and this tends to expand and damage the edge protectors and furthermore, creates difficulty in removing the deposited metal from the surface of the cathode plate.

Figures 3, 4 and 5 of the drawings depict a practical arrangement of the present invention in which the cathode plate 10 is apertured in the bottom corners thereof, and then fitted with edge protectors 11, 16 which may be of conventional form, along the side and bottom edge portions of the plate.

Subsequent to fitting of the edge protectors to the plate, the bottom corner regions of the plate are inserted into an injection mould and compatible molten plastic is allowed to fill the mould to form a moulded corner 17 integrally formed with the cathode plate 10 and the edge protectors 11, 16 as shown best in Figures 4 and 5.

It will be appreciated that such a moulding technique can be utilised with the edge protectors either fitted to the cathode plate or prior to fitting of the edge strips to the cathode plate.

The moulding of the corners to the edge strips in this embodiment includes the provision of an overlap in the joint between the edge and the corner mouldings 17 so that any thermal expansion of the plastic in the electrolyte bath is accommodated by the amount of overlap between the corner moulding and the edge strips, thus preventing any significant ingress of electrolytic material underneath the edge strips.

With reference to Figures 6 and 7 of the drawings, an alternative arrangement is disclosed.

The cathode plate is provided with edge strips 20 as shown, which meet at each of the corners of the cathode plate. The corner moulding 21 is adapted to slide over each adjacent end of the edge strip 20 to cover the corner of the cathode plate. Upper and lower wedge clips 22 and 23 are adapted to snap fit into the edge strip and the corner moulding at each corner to retain the components effectively in sealing relationship. In this regard, the corner moulding is fabricated to be a snug fit over the adjacent ends of the edge strips 20 with the wedge clips 22 and 23 completing the enclosure of the adjacent ends of the edge strip to restrict ingress of material into the corner section of the cathode plate. The internal surfaces of the clip may be grooved as shown at 24 to receive a sealant such as silicone or similar elastomeric material which has been injected into the joint to improve sealing between the corner moulding and the edge clip.

Thus the present invention provides a useful alternative to the previous attempts at forming a clearly defined cathode plate edge free of any build up of electrolytic material.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of protecting the edge portions of a cathode plate assembly useful for electrolytic deposition techniques, wherein the cathode plate is prefitted with bottom edge and side edge plastic strips, the plate and assembled edge strips being fitted into a plastic moulding apparatus, such that the bottom edge portion corners of the plate are surrounded in the mould apparatus and comprising the step of injecting plastic into the mould cavity to form moulded corner pieces integrally connected to the edge strips.

2. A corner moulding for a cathode plate adapted to interengage with side and bottom edge strips in which the moulding is preformed and adapted to be retained by clip means, interconnecting the corner moulding and edge strips in sealing relationship.

3. A corner moulding as claimed in claim 2, wherein the clip means comprise releasable clips adapted to interconnect said corner moulding and side moulding preferably in releaseable relationship.

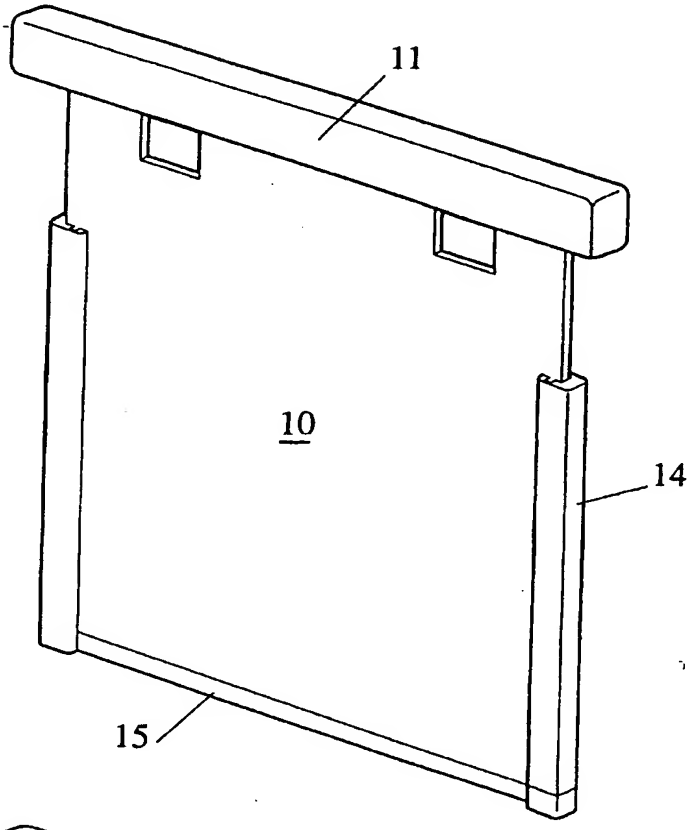
4. A clip means as claimed in claim 3, wherein the internal surface of the clip means is grooved to receive sealant injected into the assembled corner moulding to facilitate sealing between the moulding and the cathode plate.

5. A method of protecting the edge and bottom portions of a cathode plate useful in electrolytic deposition techniques, wherein edge portion strips destined to be fitted to the side and bottom edge portions of a cathode plate are joined in an assembled U configuration, plastic moulding of corner pieces to the joint between the edge strip and said side strips prior to fitting of the edge strips to the cathode plate.

6. A method as claimed in claim 1 or claim 6 wherein the cathode plate is apertured or otherwise configured to form a locking engagement with the moulded corner pieces after flowing of the plastic moulding material during the corner moulding process.

Fig 1.

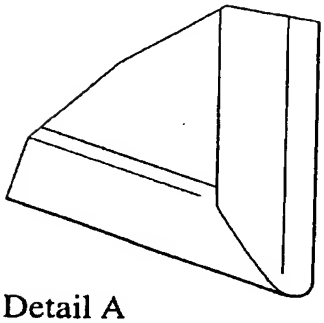
Prior Art



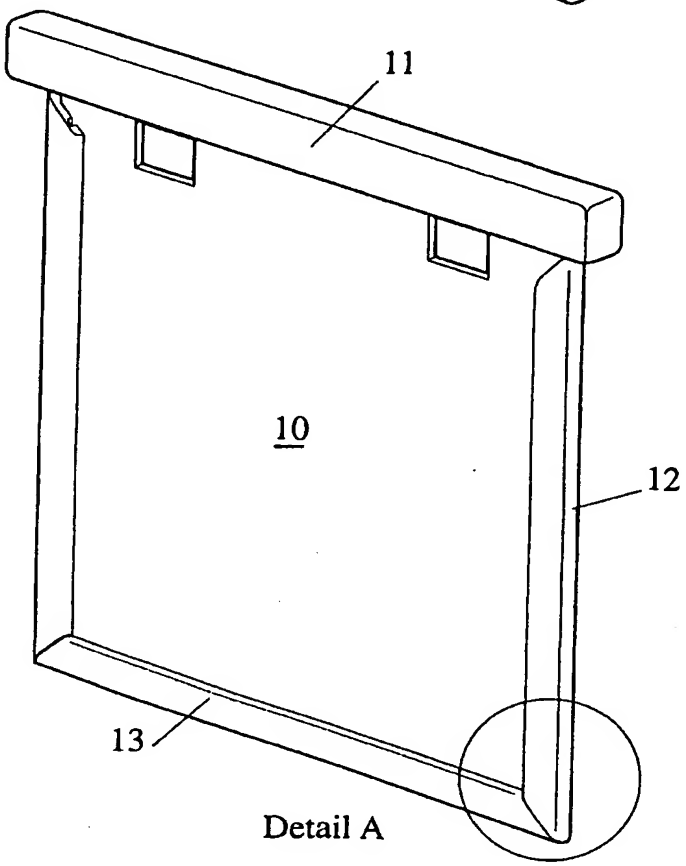
Prior Art

Fig 2.

Prior Art



Detail A



Detail A

Fig 3.

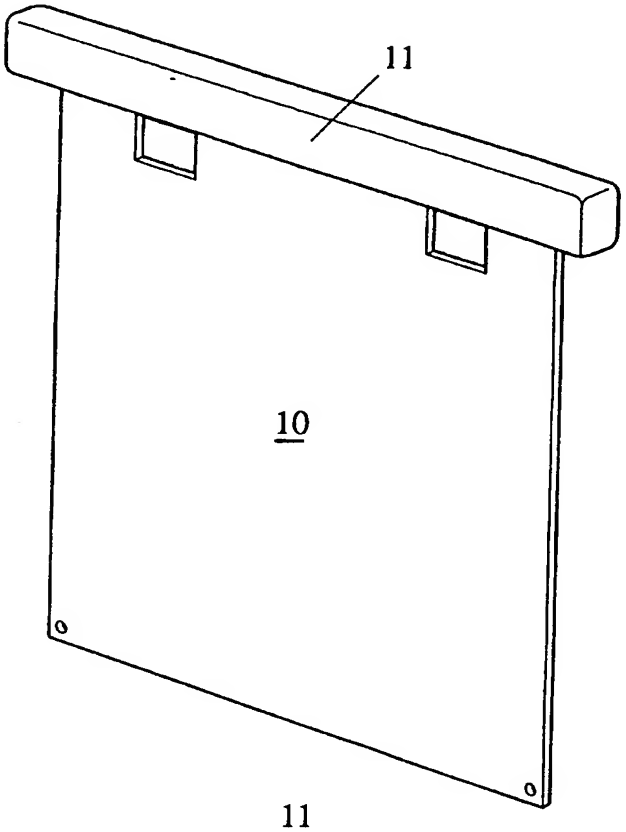


Fig 4.

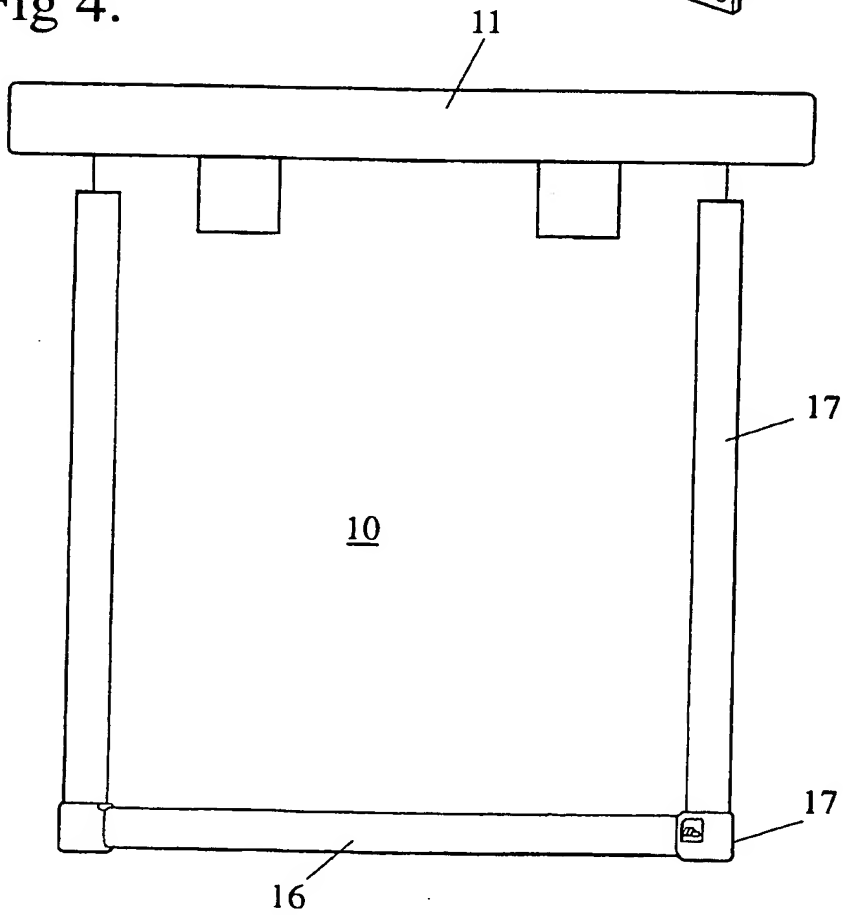
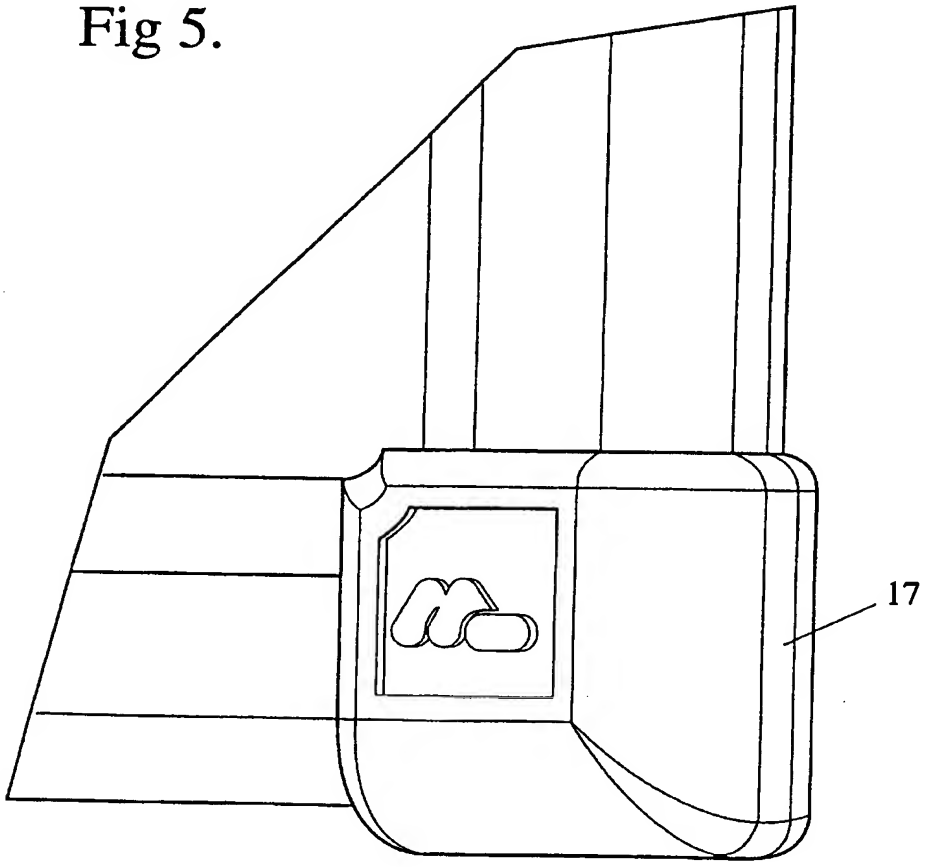


Fig 5.



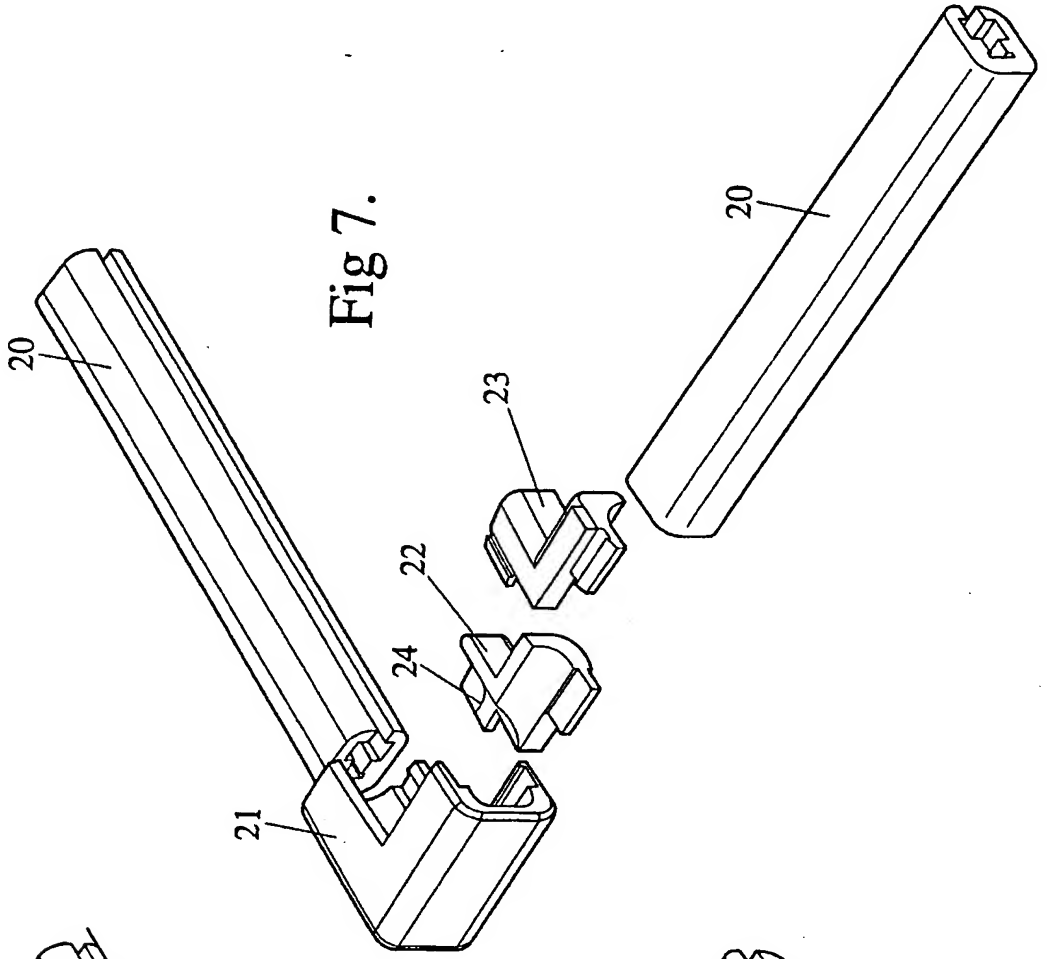


Fig 7.

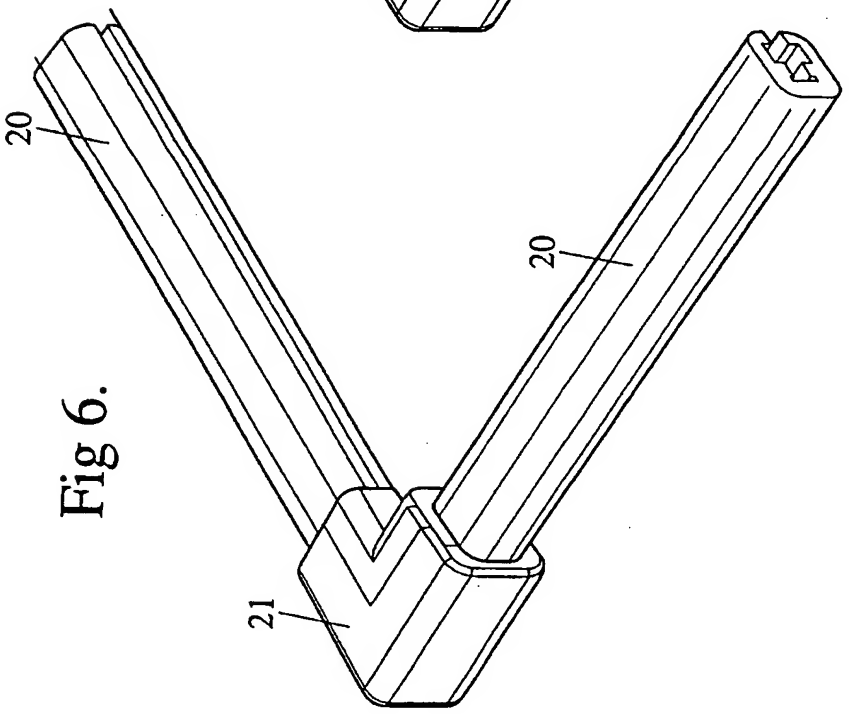


Fig 6.

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 97/00246

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: C25D 11/00, C25C 7/02, C25D 17/10, B29D 12/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C25D 11/00, C25C 7/02, C25D 17/10, B29D 12/00, A47G 1/10, E06B 3/96

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Derwent Abstract Accession No. 92-205388/25, Classes A28, M28, JP 04-136197 A2 (MITSUBISHI MATERIALS CORP) 11 May 1992 abstract	1, 5
X	Derwent Abstract Accession No. 83-812510/45, Class P27, NL 8201312 A (ALUART ALUMINIUM) 17 October 1983 abstract	2

[X] Further documents are listed in the continuation of Box C

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Date of the actual completion of the international search
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C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 294170 A1 (NATIONAL PROFILES LIMITED) 7 December 1988 page 4, line 36 to page 6 line 12	2
A	US 4752350 A (SCHUSTER) 21 June 1988 column 1, line 49 to column 2, line 12	1
A	US 4670124 A (BARTSCH) 2 June 1987 column 3, line 65 to column 5 line 12	1-6
A	US 4207147 A (BABIN) 10 June 1980 column 1, lines 11 to 27	1-6
A	Derwent Abstract Accession No. 43415C/25, classes A85, M28, DD 140624T (VEB MANSFIELD-KOMB WILHEL) 19 March 1980 abstract	1-6

INTERNATIONAL SEARCH REPORT
Information on patent family members

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Patent Document Cited in Search Report		Patent Family Member					
JP	4136197 A2						
NL	8201312 A	NL	183838 B	NL	183838 C		
AU	16971/88 A1	EP	294170 A1				
US	4752350 A	CA	1259159 A1	DE	3614673 A1		
US	4670124 A	AT	43367 E	AU	62097/86 A1	DE	3531176 A1
		EP	217429 A1	EP	217429 B1	ES	2001284 AF
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		ES	1000810 UA	ES	1000810 YA		
US	4207147 A	BE	871136 A1	CA	1082131 A1	DE	7829624 U1
		DE	2843279 A1	DE	2843279 C2	FR	2406008 A1
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